Rule WLM709: Log stream consumed most of structure resources

Finding: The SMF Type 88 data showed that the log stream consumed most of its coupling facility structure resources.

Impact: This finding has a LOW IMPACT, MEDIUM IMPACT, or HIGH IMPACT on the performance of your computer system. The level of impact depends on the applications using the log stream, and the extent to which log stream delays effects the performance of these applications..

Logic flow: This is a basic finding, based on an analysis of the SMF Type 88 system logger data.

Discussion: The system logger is an MVS component that allows an application to log data from a sysplex. You can log data from one system or from multiple systems across the sysplex.

Please refer to Rule WLM701 for more general information about the MVS system logger.

Data in a log stream is contained in two kinds of storage: (1) *interim storage*, where data can be accessed quickly without incurring DASD I/O, and (2) *DASD log data set storage*, where data is "hardened" for longer term access. When the interim storage medium for a log stream reaches a user-defined threshold, the log data is offloaded to DASD log data sets.

There are two types of log streams: coupling facility log streams and DASD-only log streams. The main difference between the two types of log streams is the storage medium system logger uses to hold interim log data:

- In a coupling facility log stream, interim storage is contained in coupling facility list structures.

- In a DASD-only log stream, interim storage is contained in local storage buffers on the system, as an MVS data space areas associated with the system logger address space.

Interim storage normally is "offloaded" to DASD log data sets based on two parameters associated with each log stream: the HIGHOFFLOAD and

LOWOFFLOAD parameters. The values for these parameters are expressed as a percent of the interim storage[1] being filled.

- When the interim storage (either coupling facility structure or staging data set) is filled to the **HIGHOFFLOAD threshold** point or beyond, the system logger begins offloading log data to the DASD log stream data sets. For example, if the HIGHOFFLOAD parameter is specified as 80% (this is the default value), the system logger normally would begin offloading interim storage to DASD log data sets when 80% or more of the structure is used.

- The **LOWOFFLOAD threshold** is the point in the interim storage (coupling facility structure or staging data set), as a percent of space consumed, where the system logger stops offloading log data to DASD log data sets. The default LOWOFFLOAD parameter value is 0%, indicating that the system logger will offload all the log stream to DASD log data sets once offloading has commenced.

When a system logger user issues the IXGWRITE macro for a coupling facility log stream, the system logger writes to the coupling facility structure. When the write completes, the system logger categorizes the event as a *Type-1*, *Type-2*, or *Type-3* completion. The categorization indicates how much space in the structure is being used by the log stream when the completion occurred.

- A *Type-1* completion indicates that, after the write completed, the percentage of the structure space used was less than the HIGHOFFLOAD threshold, meaning that system logger is using the coupling facility successfully. This is a desired completion status.

- A *Type-2* completion indicates that, after the write completed, the percentage of the structure space used was equal to or greater than the HIGHOFFLOAD threshold. This means that the system logger begins managing storage resources by migrating data from the coupling facility to DASD log data sets.

  The number of Type-2 completions is simply a count of the number of times the HIGHOFFLOAD threshold for the coupling facility structure was reached based on writes to the specific log stream. Reaching the HIGHOFFLOAD threshold might or might not be an indication of a problem.

  - You might wish log data to be frequently “hardened” to a DASD log data set. In this situation, you would define a relatively small coupling

[1] The controls apply **only** to staging data set usage with DASD-only log streams. With coupling facility log streams, the controls apply to both coupling facility structure usage and staging data set usage if the log stream is duplexed to staging data sets.

facility structure or specify a relatively low value for the HIGHOFFLOAD threshold. Consequently, you would expect to have Type-2 completions relatively often and a relatively large number of Type-2 completions would not be a cause for concern.

- You might have multiple log streams sharing the coupling facility structure, or you might not wish to experience the overhead of offloading. In this situation, a large number of Type-2 completions (with the corresponding overhead of offloading) might be cause for alarm.

- A *Type-3* completion indicates that a given log stream is close to consuming all the space in the coupling facility. A Type-3 completion can occur if there is a failure which prevents the system logger from promptly moving data from the coupling facility structure to DASD log data sets or if the system logger configuration is tuned incorrectly.

  For example, the system logger's access to its DASD log data sets would be slowed if those data sets reside on the same device as some other heavily-used data sets.

  A Type-3 can also occur if many log streams are defined to share the same structure, because each newly defined log stream causes the system logger to dynamically repartition storage among the existing log streams.

  If a log stream has a large proportion of Type-3 completions, the system logger is getting dangerously close to the STRUCTURE FULL condition.

The MVS system logger writes SMF Type 88 records containing statistics for each connected log stream. This information is available as MXG TYPE88 file.

CPExpert examines the SMF88SC3 variable (Count of Type-3 completions) in the SMF Type 88 records. CPExpert produces Rule WLM708 when the SMF88SC3 value exceeds the **STRC3** guidance variable in USOURCE(WLMGUIDE). The default value for the **STRC3** is zero, indicating that CPExpert should produce Rule WLM709 whenever the space used by a log caused the coupling facility structure to reach a critical amount.

Suggestion: If this finding is produced, determine whether there was a failure that caused the system logger to be unable to promptly offload data. If a failure did occur, you probably should ignore this finding. If a failure was not experienced, you should consider the following alternatives:

- Determine whether the system logger configuration is tuned incorrectly. The system logger might be unable to offload data promptly if the DASD log data sets experience I/O contention with other systems data sets.

- Review the structure size, to ensure that the structure is adequately sized for the log stream(s) using the structure.

- Review the number of log streams assigned to the coupling facility structure. The system logger might not be able to respond adequately if too many log streams are defined to share the same structure.

- Examine the application responsible for the log stream activity to determine whether its use of the log stream has increased, and whether this increase is expected.

- Review the HIGHOFFLOAD and LOWOFFLOAD parameters for the log stream to determine whether these should be adjusted. If either parameter value is too large, the system logger might not be able to respond adequately. The system logger might not have time to offload sufficient log stream data when the HIGHOFFLOAD parameter value is reached, before the log stream uses most of the structure. The system logger might offload only a relatively small amount of data once offloading commences, if the LOWOFFLOAD parameter is too high. Either of these situations could indicate that the parameters are too large, or could simply be the result of the coupling facility structure being too small.

- Review the size of the off-load data sets. These should be large enough to avoid too many "DASD shifts"--that is, new data set allocations. Rule WLM707 would be produced by CPExpert if too many DASD shifts occurred. However, you might have altered the guidance to CPExpert for Rule WLM707. In this case, Rule WLM707 might not be produced even though DASD shifts could have delayed the offloading of the log stream(s) assigned to the coupling facility structure.

Reference: OS/390 MVS System Management Facilities

OS/390 (V2R6):	Section 9.1.1.2
OS/390 (V2R7):	Section 9.1.1.2
OS/390 (V2R8):	Section 9.1.1.2
OS/390 (V2R9):	Section 9.1.1.2
OS/390 (V2R10):	Section 9.1.1.2
z/OS (V1R1):	Section 9.1.1.2
z/OS (V1R2):	Section 9.1.1.2
z/OS (V1R3):	Section 9.1.1.2
z/OS (V1R4):	Section 9.1.1.2

